



Automotive Sensing and Viewing

2.1 μm HDR LFM Image Sensors

By

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Agenda



Pixel Size Impact



Key Challenges in Automotive

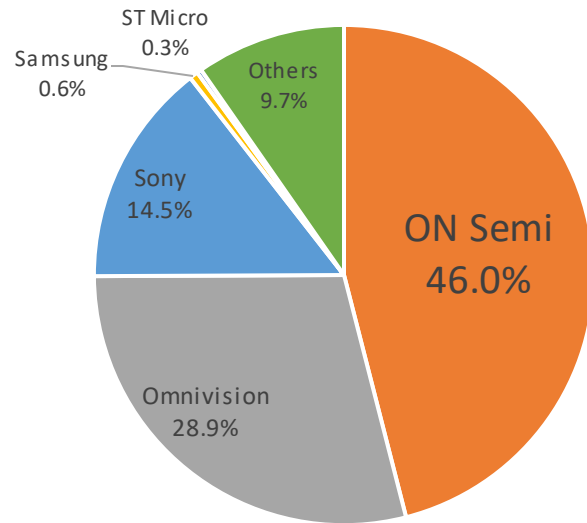


2.1 μ m pixel Solution

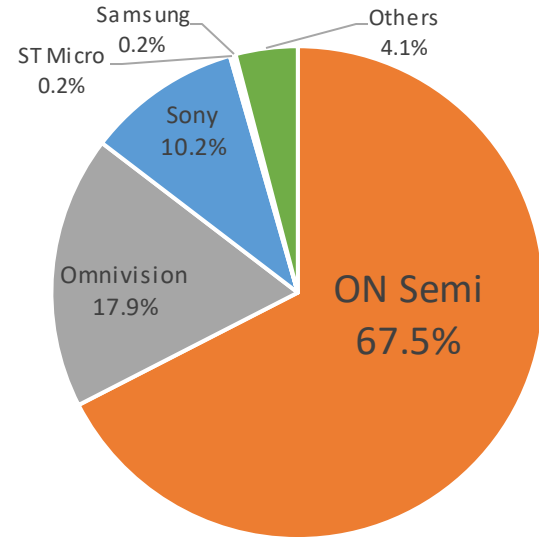
onsemi the Automotive Image Sensor Leader

Automotive Image Sensor Market Share

Total Automotive Image Sensors



Sensing Camera Image Sensors (ADAS, AD)



AR0820

Industry's First 8MP
Automotive-Grade Image Sensor

**Automotive Sensing Leader for over 10 years
On The Road since 2004**

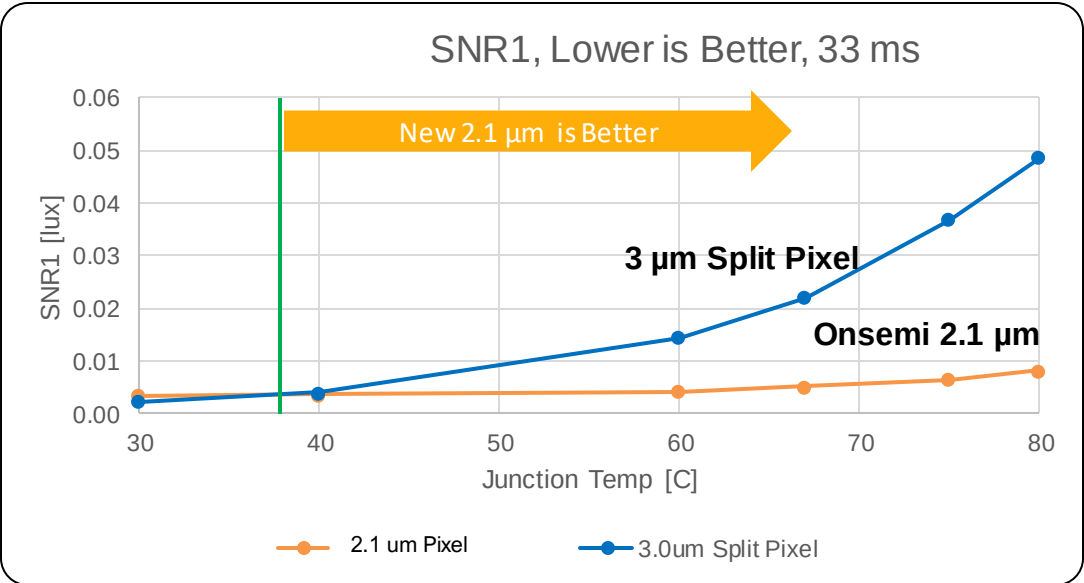
Source: Techno Systems Research Co., Ltd., Automotive camera Market Analysis 2021-2022 report

onsemi + Subaru Partnership : Top-Notch Advanced Safety



今、自動車業界で始まった革新が、

Low Light Performance



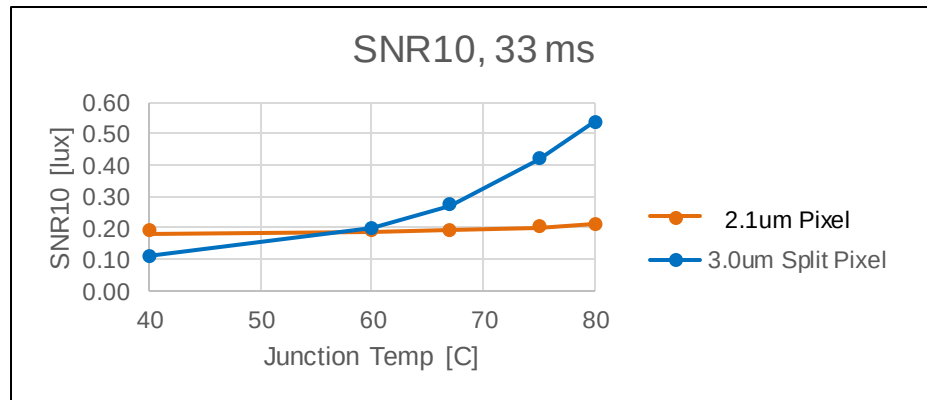
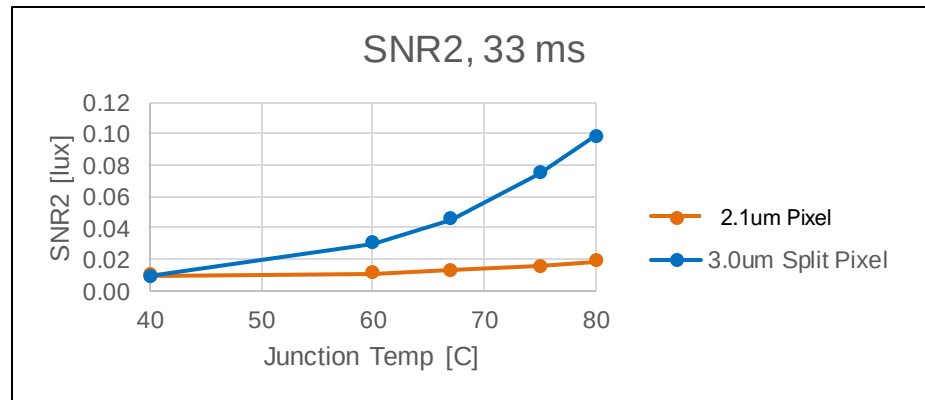
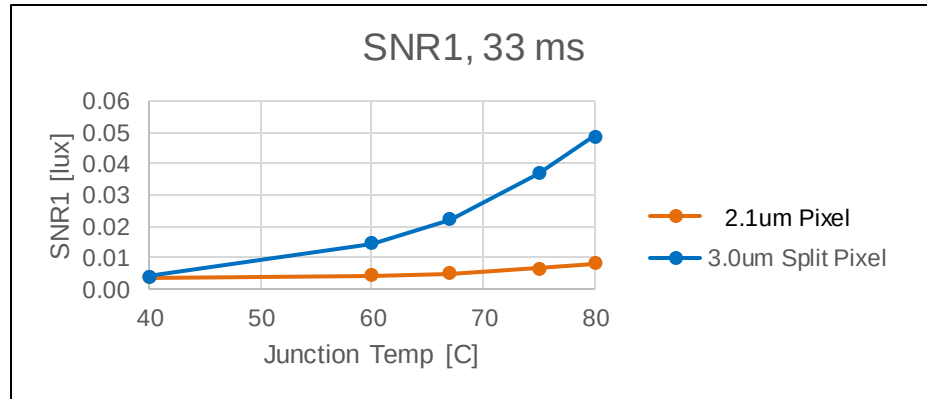
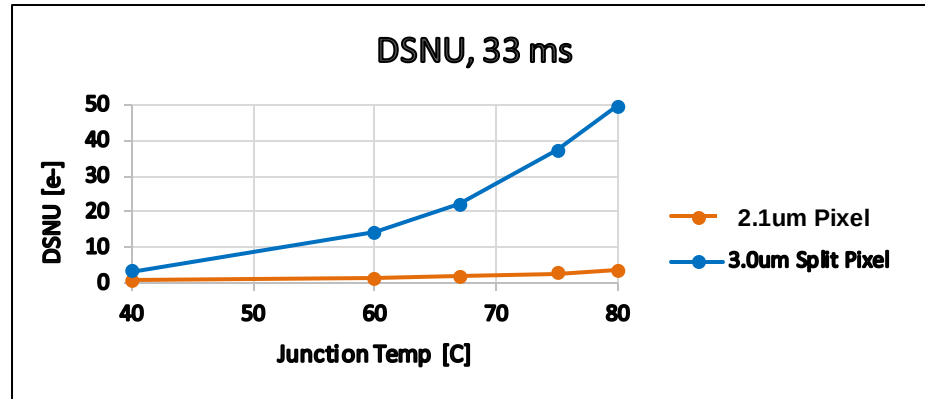
- SNR2 cross over at ~40°C
- SNR10 cross over at ~59°C

Linear SNR values, lux on sensor, 33 ms exposure, D65, 670nm IRCF, no corrections

City	Avg Temp C, 9:00 PM	July/Aug Sunset	Junction w/20 C Rise
New York, NY	25	8:09 PM	45
Miami, FL	28	8:05 PM	48
New Orleans, LA	26	7:51 PM	46
Phoenix, AZ	36	7:25 PM	56
Columbus, OH	23	8:43 PM	43
San Antonio, TX	29	8:24 PM	49
Washington DC	25	8:17 PM	45

2.1 μm Low Light Performance Stable Across Temperature

SNR1/2/10 vs. Temp: 2.1um vs 3um



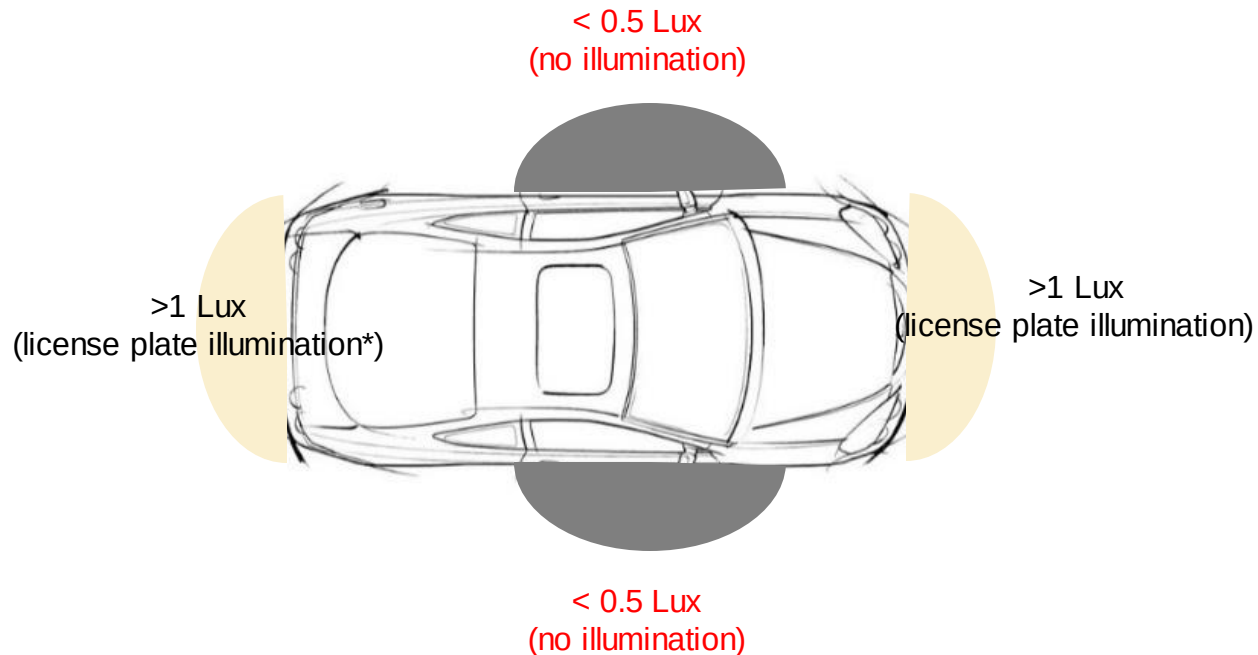
Green pixel linear SNR values, lux on sensor, D65, 33 ms exposure, no corrections or filtering

- 3 um split pixel has much higher DSNU than onsemi 2.1 um pixel
- SNR1 performance cross over at 40C junction temperature (common temperature even at night)

onsemi 2.1 μ m pixel Stable Across Temperature

Examples: Enhanced Low Light Need from Imagers

- SVS* side cameras need to perform at almost zero illumination
 - No vehicle illumination
 - Current Lights illuminate optical mirrors/driver sees through windows
 - Headlights/Break lights do not illuminate direct surrounding



*Surround View Systems

The “Flicker” Problem

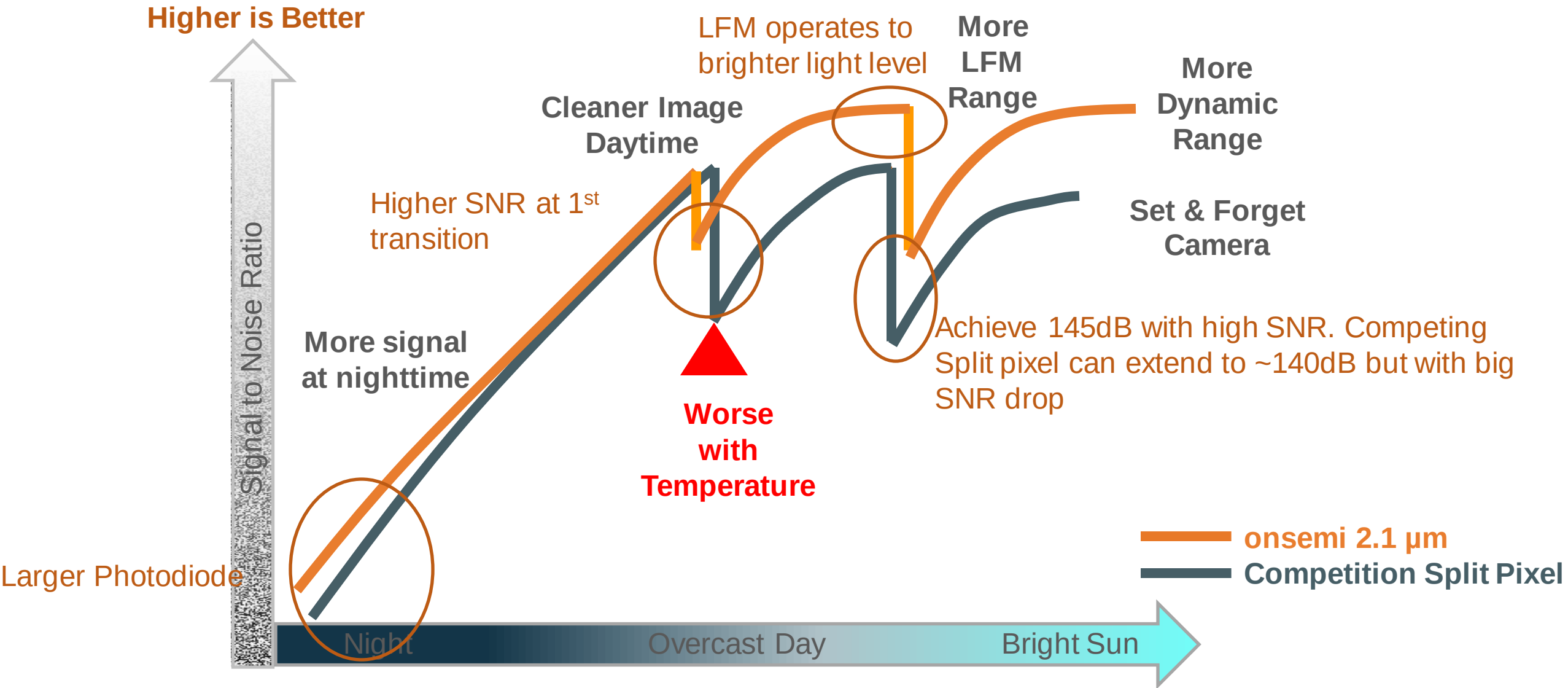


Multi-exposure HDR (top) vs. Pulsed LFM HDR (bottom)
image captures of flickering LED Lights



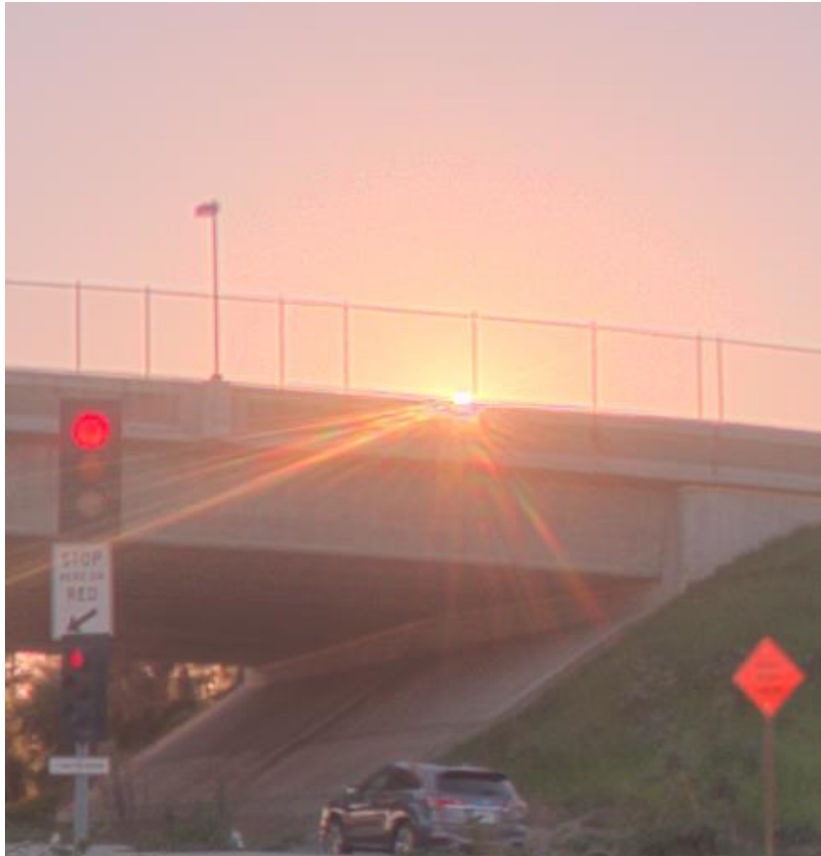
Flicker of LED Taillights

“LFM” Sensor – Better Images

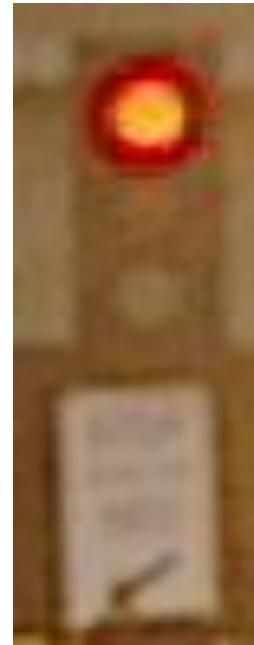


World's First Auto-Grade 150 dB Ultra HDR Image Sensor

onsemi Hyperlux Technology



Competing Technology



Fewer Blind Spots Enhance Automotive Safety

HDR LFM Image Quality, Low Light ~10 lux

onsemi Hyperlux Technology

3 μm Split-diode 3 MP



60-deg field of view 2.1 μm RGGB 1920x1536, no filtering or corrections, Devware color processing



60-deg field of view 1920x1536, filtering and corrections enabled, GW5 color processing

Superior Low Light Performance for onsemi 2.1 μm Pixel

Blind Time On Lighting Changes Impacts Automotive Safety

- **Sensors with < 140 dB DR*, MUST adjust exposure time on lighting changes**
 - ECU controls sensor exposure time
 - System can go blind: frames incorrectly exposed when changes are needed



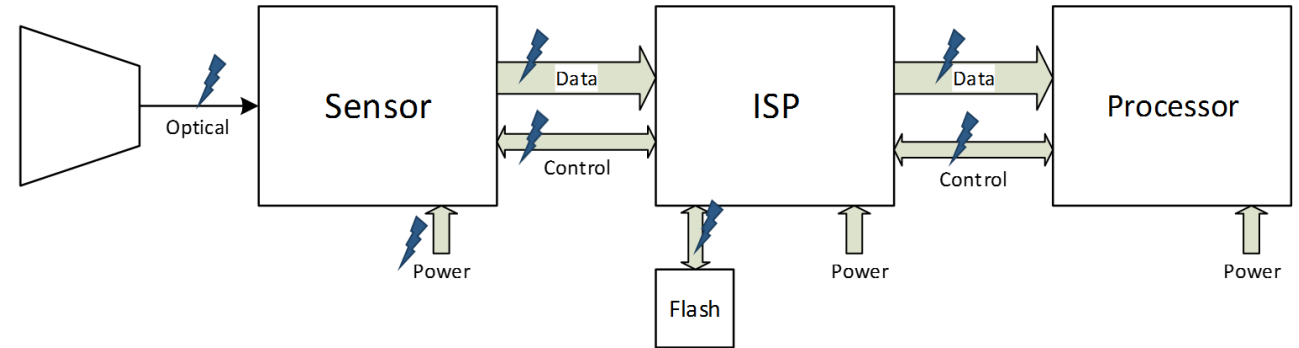
onsemi Product Dynamic Range – No Auto Exposure Needed

- onsemi 2.1 μm pixel (150dB) has enough DR, no exposure/gain changes



Onsemi: “Set it & Forget It”

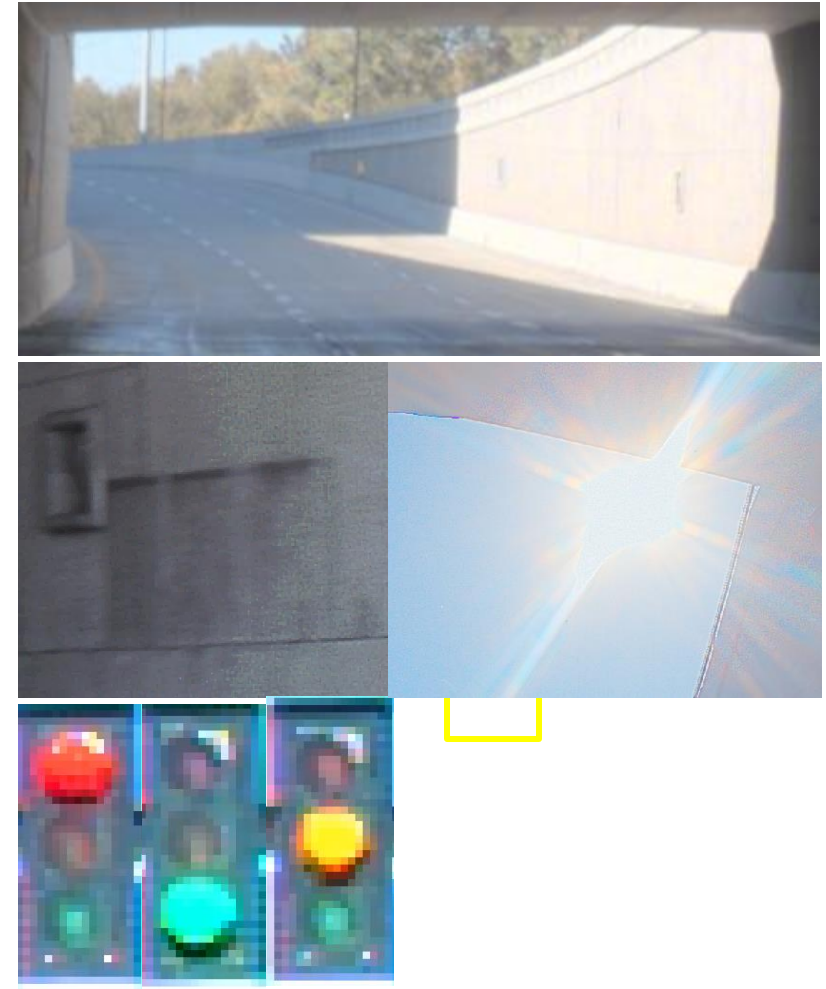
Cyber-Security: Can Sensors Be Hacked ?



- onsemi solution has highest coverage of threat vectors
- onsemi solution
 - Secure initialization and device authentication
 - Control Channel protection
 - Video stream authentication

onsemi 2.1 μm “Hyperlux” Advantage Summary

- **Highest Dynamic Range**
 - 115 Flicker Free Dynamic Range.
 - LFM Operates to brighter lighting conditions, more likely to capture LED Lights
 - 150 dB Total Dynamic Range, maintaining high SNR
- **Best Low Light Performance**
 - Without corrections
 - Capturing more details in darkness and bright light
- **Best SNR across entire Temperature Range**
 - Safest Solutions for safety critical applications





Intelligent Technology. Better Future.

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